

## CLAIMS

1. Architecture for monitoring Quality of Service (QoS) in a telecommunication network comprising a set of terminals (MT), characterised in that:
- 5 - the terminals (MT) of said set house measuring agents (MEA, MEM) which can be configured to interface with processes selected among processes for managing the application sessions of said network and processes for measuring the operating conditions of the network
- 10 itself, and
- also provided is a management and configuration subsystem (TQMS) comprising a scheduling module (S) for scheduling Quality of Service measuring campaigns, capable of involving respective sub-sets of said set of
- 15 terminals according to a set of identifying characteristics of the measuring campaign; said scheduling module being able to configure, for the purposes of the execution of the said measuring campaigns, the measuring agents housed by the terminals
- 20 included in said related sub-sets according to said set of identifying characteristics.
2. Architecture as claimed in claim 1, characterised in that an additional subsystem (TDCM) is provided for managing the collection of measurement data, said
- 25 additional subsystem comprising at least one of a database (DB) for storing said measurement data and of a processing centre (EC) for processing said measurement data.
3. Architecture as claimed in claim 1, characterised in
- 30 that said measuring agents (MEA, MEM) housed by the terminals (MT) of said set are configured (CA1) to dialogue with homologous measurement and management agents.

4. Architecture as claimed in claim 1, characterised in that at least some of the terminals (MT) of said set are mobile terminals.

5. Architecture as claimed in claim 1, characterised in that said measuring agents (MEA, MEM) are configured to perform operations selected in the group constituted by:

- conducting co-ordinated measurements on said telecommunication network,
- 10 - performing local storage and pre-processing operations according to the processing conditions of said network, and
- managing the transfer of the measurement results to said at least an additional subsystem (TDCM) for
- 15 managing the collection of the measurement data.

6. Architecture as claimed in claim 1, characterised in that said measuring agents (MEA, MEM) are configured to conduct measurements selected in the group constituted by:

- 20 - measuring the quality and operating conditions of the radio access referred to said terminals,
- monitoring end-to-end transport performance in real traffic,
- monitoring end-to-end transport performance in
- 25 artificial traffic,
- measurements and processing on said terminals (MT) to produce quality of service indicators at the application layer, and
- monitoring the operating conditions of the resources
- 30 of said terminals (MT) and of said network.

7. Architecture as claimed in claim 1, characterised in that said measuring agents (MEA, MEM) are configured to measure the load state of the terminal (TM) and/or of the network and to adapt the monitoring to the load

35 state measured.

8. Architecture as claimed in claim 1, characterised in that said management and configuration subsystem (TQMS) comprises at least a respective communication agent (CA2) capable of interfacing with respective communication agents (CA1) associated to said measuring agents (MEA, MEM) housed by the terminals of said set.
9. Architecture as claimed in claim 2, characterised in that said management and configuration subsystem (TQMS) comprises at least one respective communication agent (CA2) capable of interfacing with one homologous communication agent (CA3) comprised in said additional subsystem (TDCM) for managing the collection of the measurement data.
10. Architecture as claimed in claim 1, characterised in that said management and configuration subsystem (TQMS) comprises an interface (A1) for interfacing with a user.
11. Architecture as claimed in claim 2, characterised in that said additional subsystem (TDCM) for managing the collection of the measurement data comprises a respective communication agent (CA3) configured to communicate with respective communication agents (CA1) associated to said measuring agents (MEA) housed by the terminals (MT) of said set.
12. Architecture as claimed in claim 2, characterised in that said additional subsystem (TDCM) for managing the collection of the measurement data comprises a respective interface (A3) for interfacing said architecture with external systems.
13. Architecture as claimed in claim 2, characterised in that said measuring agents (MEA, MEM) housed by the terminals (TM) of said set are configured (CA1) for the direct transfer of said measurement data to said additional sub-system (TDCM) for managing the collection of the measurement data.

14. Architecture as claimed in claim 1, characterised in that said measuring agents (MEA, MEM) operate according to Jade technology.

15. Architecture as claimed in claim 3, characterised in that said measuring agents (MEA, MEM) dialogue with said homologous agents with a communication resource selected in the group constituted by:

- information transport by means of SMS,
- TCP/IP transport,
- 10 - UDP/IP transport.

16. Architecture as claimed in claim 1, characterised in that said scheduling module (S) is configured to perform at least an operation selected in the group constituted by:

- 15 - defining the identifying characteristics of a measurement campaign,
  - identifying the terminals to be subjected to said campaign,
  - defining the measurements to be made and the
- 20 Quality of Service indicators to be obtained,
  - defining the characteristics of the measurements to be made, and
  - defining the contextual information associated to the measurements carried out by said measuring agents
- 25 (MEA).

17. Architecture as claimed in claim 1, characterised in that, in order to identify said respective sub-sets of said set of terminals, said scheduling module (S) is configured to carry out operations selected in the group constituted by:

- 30 - continuous search for the terminals meeting the identifying characteristics of the measurement campaign,
- recording said terminals on an internal database,

- creating a measurement profile with the information for conducting said measurements by a respective measuring agent (MEA),
  - activating the campaign on the involved terminals,
  - 5 - sending the measurement information collected from said terminals (TM),
  - identifying the terminals subjected to changes of the relevant characteristics for the purposes of the measurement,
  - 10 - deactivating the campaign,
  - deleting measurement profiles from said terminals (MT) and related information for the purpose of a determined measurement campaign.
18. A method for monitoring Quality of Service (QoS) in
- 15 a telecommunication network comprising a set of terminals (MT), characterised in that it comprises the steps of:
- associating to the terminals (MT) of said set measuring agents (MEA, MEM) which can be configured to
  - 20 interface with processes selected among processes for managing the application sessions of said network and processes for measuring the operating conditions of the network itself, and
  - conducting (TMQS, S) Quality of Service measuring
  - 25 campaigns, capable of involving respective sub-sets of said set of terminals according to a set of identifying characteristics of the measuring campaign configuring, for the purposes of the execution of the said measuring campaigns, the measuring agents (MEA, MEM) associated
  - 30 to the terminals included in said respective sub-sets according to said set of identifying characteristics.
19. A method as claimed in claim 18, characterised in that comprises the step of managing (TDCM) the collection of measurement data providing at least one
- 35 of a database (DB) for storing said measurement data

and a processing centre (EC) for processing said measurement data.

20. A method as claimed in claim 18, characterised in that it comprises the step of configuring (CA1) said  
5 measuring agents (MEA, MEM) associated to the terminals (MT) of said set to dialogue with homologous measurement and management agents.

21. A method as claimed in claim 18, characterised in that it comprises the step of selecting at least some  
10 of the terminals (MT) of said set as mobile terminals.

22. A method as claimed in claim 18, characterised in that it comprises the step of configuring said measuring agents (MEA, MEM) to perform steps selected in the group constituted by:

- 15 - conducting co-ordinated measurements on said telecommunication network,
  - performing local storage and pre-processing operations according to the processing conditions of said network, and
- 20 - managing the transfer of the measurement results to said at least an additional sub-system (TDCM) for managing the collection of the measurement data.

23. A method as claimed in claim 18, characterised in that it comprises the step of configuring said  
25 measuring agents (MEA, MEM) to conduct measurements selected in the group constituted by:

- measuring the quality and operating conditions of the radio access referred to said terminals,
- monitoring end-to-end transport performance in real  
30 traffic,
  - monitoring end-to-end transport performance in artificial traffic,
  - measurements and processing on said terminals (MT) for the production of Quality of Service indicators at  
35 the application layer, and

- monitoring the operating conditions of the resources of said terminals (MT) and of said network.

24. A method as claimed in claim 18, characterised in that it comprises the steps of:

5 - measuring, by means of said measuring agents (MEA, MEM), the load state of the terminal (TM) and/or of the network, and

- adapting the monitoring to the measured load state.

25. A method as claimed in claim 18, characterised in  
10 that it comprises the step of providing a sub-system (TQMS) for the management and configuration of the measurement campaigns capable of interfacing (CA1, CA2) with said measuring agents (MEA, MEM) housed by the terminals of said set.

15 26. A method as claimed in claim 19, characterised in that it comprises the steps of:

- providing a sub-system (TQMS) for the management and configuration of the measurement campaigns,

- providing an additional sub-system (TDCM) for  
20 managing the collection of the measurement data capable of interfacing (CA2, CA3) with said a sub-system (TQMS) for the management and configuration of the measurement campaigns.

27. A method as claimed in claim 18, characterised in  
25 that it comprises the step of providing a sub-system (TQMS) for the management and configuration of the measurement campaigns capable of interfacing (A1) with a user.

28. A method as claimed in claim 19, characterised in  
30 that it comprises the step of providing an additional sub-system (TDCM) for managing the collection of the measurement data configured (CA3) to communicate with said measuring agents (MEA) associated to the terminals (MT) of said set.

29. A method as claimed in claim 19, characterised in that it comprises the step of providing an additional sub-system (TDCM) for managing the collection of the measurement data configured (A3) for interfacing with  
5 external systems.

30. A method as claimed in claim 19, characterised in that it comprises the steps of:

- providing additional sub-system (TDCM) for managing the collection of the measurement data, and
- 10 - configuring said measuring agents (MEA, MEM) associated to the terminals (TM) of said set (CA1) for the direct transfer of said measurement data to said additional sub-system (TDCM) for managing the collection of the measurement data.

15 31. A method as claimed in claim 18, characterised in that said measuring agents (MEA, MEM) operate according to Jade technology.

32. A method as claimed in claim 20, characterised in that it comprises the step of configuring said  
20 measuring agents (MEA, MEM) for dialoguing with said homologous agents with a communication resource selected in the group constituted by:

- information transport by means of SMS,
- TCP/IP transport,
- 25 - UDP/IP transport.

33. A method as claimed in claim 18, characterised in that the step of conducting said measurement campaigns in turn comprises at least an step selected in the group constituted by:

- 30 - defining the identifying characteristics of a measurement campaign,
- identifying the terminals to be subjected to said campaign,
- defining the measurements to be made and the
- 35 Quality of Service indicators to be obtained,



- defining the characteristics of the measurements to be made, and

- defining the contextual information associated to the measurements carried out by said measuring agents (MEA).

34. A method as claimed in claim 18, characterised in that, in order to identify said respective sub-sets of said set of terminals, it comprises steps selected in the group constituted by:

- 10 - continuous search for the terminals meeting the identifying characteristics of the measurement campaign,
  - recording said terminals on an internal database,
  - creating a measurement profile with the information
- 15 for conducting said measurements by a respective measuring agent (MEA),
  - activating the campaign on the involved terminals,
  - sending the measurement information collected from said terminals (TM),
- 20 - identifying the terminals subjected to changes of the relevant characteristics for the purposes of the measurement,
  - deactivating the campaign,
  - deleting measurement profiles from said terminals
- 25 (MT) and related information for the purpose of a determined measurement campaign.

35. Telecommunication network characterised in that it comprises, associated to the network itself, a monitoring architecture as claimed in any of the claims 1 through 17.

36. Telecommunication network as claimed in claim 35 characterised in that it comprises at least an application server housing at least a measuring agent able to interact with said monitoring architecture.

37. Computer program product capable of being loaded into the memory of at least one electronic computer and comprising portions of software code for implementing the architecture as claimed in any of the claims 1  
5 through 17 or the method as claimed in any of the claims 18 through 34.